

## Summary of the PM Emission Inventory Workshop for Stationary and Area Sources

Thursday, August 16, 1999  
ARB Headquarters  
Sacramento, CA

This document provides a brief accounting of the workshop, which is followed by a more complete summary.

- Workshop Objectives
  - Provide an overview of ongoing particulate matter (PM) emission inventory work within the ARB by the Planning and Technical Support Division (PTSD), the Mobile Source Control Division (MSCD), and the Research Division (RD)
  - Provide future research plans and projects for PTSD
  - Receive comments from public on research ideas
- Attendance
  - 39 total (7 consultant, 4 government, 11 district, 5 academic researcher, 4 industry, 8 ARB staff)

### Summary of source categories of concern and issues raised at workshop:

**Geologic Dust:** construction activities, leaf blowers, paved road dust, fund practices and alternatives for agricultural activity dust reduction, possibly use off-road model activity data for inputs to geologic dust methodologies

**Point sources:** woodworking and finishing operations (direct PM), cooling tower drift, ammonia from compost facilities and sewage sludge

**Mobile sources:** ammonia from motor vehicles, off-road model activity and population improvement, construction equipment exhaust, development of better PM size and chemical information

**Particulate precursor emissions:** ammonia from mobile sources, diesel exhaust from construction, evaluation of heterogeneous reactions for secondary formation, seasonal variation and volatility of nitrates, ammonia from compost facilities and sewage sludge, ammonia from the ocean

**Other areas:** purchase a GPS system that districts could borrow to refine their facility location information, refine regional and near scale emissions evaluations, evaluate rule effectiveness and compliance, develop better chaparral and grassland burning emission factor and chemical data, effects of sea salt on PM formation and variability with meteorology, provide opportunity for public input during project development process

## **Summary of the PM Emission Inventory Workshop for Stationary and Area Sources**

### **Workshop Summary**

On August 26, 1999, the Emission Inventory Branch of ARB's Planning and Technical Support Division held a public workshop to discuss particulate matter (PM) emission inventory development and research. The workshop included approximately an hour and a half of presentations by ARB staff. This was followed by about an hour of discussion with those in attendance to evaluate current research concepts and identify areas of future research. The remainder of this document describes the workshop, the comments received, and ARB staff responses.

To begin the meeting, Dale Shimp, the manager of the Emission Inventory Analysis Section (EIAS), provided an overview of the workshop and some background information about the regulatory and technical needs for developing particulate matter emission inventories. Patrick Gaffney, with the EIAS then provided a summary of the issues and problems involved in developing PM and ammonia emission inventories.

Karen Magliano, the CRPAQS Project Manager working for the ARB's Modeling Support Section, then provided a brief overview of the PM inventory related projects sponsored by the California Regional Particulate Air Quality Study (CRPAQS). This was followed by a presentation by Hector Maldonado, with ARB's Emission Control Technology Research Section, who described research efforts to better estimate and understand particulate emissions from mobile sources of emissions including vehicles, off-road equipment, and two-stroke utility engines. Randy Pasek, manager of the Atmospheric Processes Analysis Section, then provided information about some new particulate analysis and measurement techniques that will help with inventory development.

Patrick Gaffney then discussed the methods used by the Emission Inventory Branch to identify and prioritize current and future inventory research projects. He then summarized the ongoing and potential future inventory projects that are managed by the Emission Inventory Analysis Section and opened the meeting for comments.

More detailed information presented by each speaker is provided on the workshop presentation slides which are viewable and downloadable at:  
<http://arb.ca.gov/emisinv/pmnh3/pmnh3.htm>

The comments discussed during the workshop and the responses follow.

## PM Emission Inventory Workshop for Stationary and Area Sources

### Summary of Comments Received and Responses

NOTE: An official transcript of the meeting was not taken. This summary is provided only to give a general sense of the issues raised, and the immediate thoughts of ARB staff on the issues discussed. The responses are for information purposes only, and are not meant to be completely definitive, nor are they meant to commit to any specific course of action.

### Geologic Dust

- **Construction dust emissions** – It was suggested that improvements be made to the emission rate, activity data, and operational data used for computing construction site emissions. These emissions could include operations such as stucco application, sheet rock finishing, and other operations beyond site preparation.

*Response:* At this point the overall contribution of construction related emissions to PM emissions, especially to PM<sub>2.5</sub> emissions, do not appear to warrant additional effort at this time. Construction site operations may cause some near-scale emission and nuisance impacts, but they do not appear to be significant contributors to elevated regional PM levels. However, as resources are available, the ARB is interested in developing techniques to better define the location and quantity of emissions from this source using geographic information systems (GIS) technology.

- **Paved road dust** – A comment was raised about the uncertainty in paved road dust estimates and problems that arise when it is assumed that road dust emissions increase directly with the number vehicles traveling in roads.

*Response:* There is substantial uncertainty in our estimates of paved road dust. To assist with this, we have sponsored a project with UC Riverside, CE-CERT, to perform real-time road dust emissions testing using an instrumented vehicle and roadside monitoring. It is expected that this project will provide data that will allow us to validate and improve our paved road dust estimates.

Regarding the concerns of forecasting paved road dust emissions based strictly on increases in vehicle miles traveled (VMT), we have attempted to reduce this problem by changing how the paved road dust emissions are grown in our latest paved road dust emission estimation methodology (available at: <http://arb.ca.gov/emisinv/areasrc/onehtm/one7-9.htm>). Now, emissions from the less traveled local and collector roads are still grown based on increases in vehicle miles traveled (VMT), but emissions from major roads and freeways are grown

based on increases in lane miles, and not VMT. This change is based on an assumption that roadways with high levels of traffic have reached an equilibrium state between the dust entrainment and deposition, which assumes that adding additional traffic does not necessarily produce additional dust emissions.

- **Evaluation of controls and alternate practices for agricultural sources** – It was suggested that funding be applied to examining and developing alternative practices and equipment that could reduce dust emissions from agricultural operations.

*Response:* The ARB is very interested in encouraging practices that reduce emissions. Because the purpose of the workshop was to focus on emission inventory development issues, we were not able to provide much help in this area. However, the South Coast Air Quality Management District does have an adopted rule (Rule 403, available at [www.aqmd.gov](http://www.aqmd.gov)) to reduce agricultural dust emissions, and other districts and states have looked into measures such as controlling dust from unpaved roads used for agricultural activities. At this point, no ARB funding is allocated for agricultural controls development.

- **Off-road equipment dust emissions** – It was suggested that it might be possible to use the model used to compute off-road exhaust emissions to refine the activity (i.e. equipment use) data used to compute the dust emissions from off-road equipment.

*Response:* We are interested in this approach because the activity data for the exhaust model may be more complete and refined than the limited data now used for some of the off-road sources, such as construction equipment. However, there may be a problem with the data not being in a readily usable format for dust related emission estimates (such as hours of operation), because some of the exhaust data will be based on other factors. We will look into the applicability of the off-road model activity data to dust emission estimates.

- **Dust and exhaust emissions from leaf blowers** – It was asked if the ARB includes these estimates in our emission inventory.

*Response:* Currently these emissions are not inventoried. However, the California Legislature has asked the ARB to evaluate the exhaust and dust emissions from leaf blowers, so more work will be performed in this area. A report is due to the Legislature on January 1, 2000.

## Point sources

- **Woodworking and finishing operations (direct PM)** – It was asked if the ARB could provide some assistance in estimating emissions from this source. The SCAQMD also has a report forthcoming which provides some emissions rate data.

*Response:* Although there may currently be significant uncertainty for these point source emissions, they are not currently seen as a significant contributor to PM exceedances. Because of this, it will probably not be feasible to allocate resources to this source category in the near resources. However, we are interested in sharing whatever data the districts develop with other districts to help improve the estimates and promote consistency for woodworking operation emissions.

- **Cooling tower drift** – It was suggested that the emissions from cooling tower drift be more closely examined.

*Response:* This is an interesting category, but it will generally fall lower in our prioritization of sources because it is generally not seen as a significant contributor to elevated PM levels. After some of the more significant PM sources are better understood, it may be worth more closely evaluating emissions from cooling towers for the regions in which it is thought they may produce meaningful PM levels.

## Mobile sources

- **Ammonia emissions from motor vehicles** – There were concerns about the potential of catalyst equipped motor vehicles (MVs) to be significant sources of ammonia, especially in urban areas.

*Response:* The ARB is performing informal ammonia tests in their labs in El Monte to get a rough estimate of the possible range of ammonia emissions from MVs. This is a emissions source that is of concern to the ARB and it is expected that future research will be funded by our Mobile Source Control Division to better quantify these emissions.

- **Off-road model activity and population improvement** – It was suggested that efforts be made to improve the activity data and equipment population data for off road equipment.

*Response:* It is know that there are shortcomings in this area. ARB's off-road model and other efforts will help to improve these data, but there will still be additional work to be done, especially to better estimate localized emissions.

- **Diesel exhaust from construction equipment and double counting exhaust when performing dust estimates** – It was asked if allowances are made to avoid double counting exhaust emissions from diesel powered construction equipment

*Response:* No. Dust emissions and exhaust emissions are computed separately so there is some double counting of emissions. However, because the dust related PM emissions are so much larger than the exhaust PM emission, they will overwhelm any small amount of exhaust mixed in, so the ‘double-counting’ really does not affect the reasonableness of the construction dust emission estimates (especially considering all of the other uncertainties with construction dust estimates).

- **Development of better PM size and chemical information for vehicles** – There is a need to get better PM chemical and size information, as well as overall emission rates. This data can be used to improve air quality models.

*Response:* Projects are in place now by the Mobile Source Control Division to further measure gasoline and diesel vehicle particulate emission rates. It is expected that this updated data will be available in less than two years.

#### **Particulate precursor emissions:**

- **Ammonia emissions from motor vehicles** – There were concerns about the potential of catalyst equipped motor vehicles to be significant sources of ammonia, especially in urban areas.

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- **Evaluation of heterogeneous reactions for secondary PM formation** – It was mentioned that more modeling work needs to be done to evaluate the effects of fog, moisture, and other factors, on the how secondary PM forms via heterogeneous reactions (i.e., reactions that do not occur through the typical mixing and atmospheric chemical reactions).

*Response:* It was agreed that more work needs to be done in this area and it was suggested that as future measurement devices, such as single particle analyzers, become more available, they can be used to help better understand PM formation under these conditions.

- **Seasonal variation and volatility of nitrates** – Work should be performed to evaluate how nitrate levels vary regionally and seasonally, and how the volatility and stability of nitrates are affected by climatic conditions.

*Response:* For some regions work has been done to evaluate regional and seasonal nitrate variations, however it is far from comprehensive. There is also some work that has been done to evaluate nitrate losses from filters, but certainly more needs to be done to better understand how nitrates are affected by climatic conditions. As the monitoring networks and modeling efforts continue to develop, more information will be available to better evaluate the levels and behavior of nitrates in the atmosphere during different seasonal and climatic conditions.

- **Ammonia from compost facilities and sewage sludge** – These categories are currently uninventoried for most of the state. The SCAQMD includes these emissions in their most recent ammonia inventory and they appear to be a substantial source.

*Response:* Although compost and sludge ammonia are not one of the highest emissions priorities, they are potentially significant enough to warrant further study. Because these sources are often specific point sources, in many cases it may be most effective for the air districts to inventory these emissions based on emission factor and other guidance that could be developed by the ARB. However, currently there are other sources that appear to produce much higher emissions levels, so it will probably be at least a year or more before the ARB is able to look into this category in any detail.

- **Ammonia from the ocean** – It is known that the ocean is a source and sink of ammonia. Can these effects be evaluated?

*Response:* This is an interesting source category, but the ARB will initially focus our efforts on anthropogenic and land based biogenic ammonia emissions. If some information becomes available which indicates that oceanic ammonia may contribute to elevated PM levels, then we are willing to adjust these priorities as needed.

## Other Topics

- **GPS system purchase** – It was suggested that the ARB purchase portable GPS systems that air districts could borrow to refine their facility location information for future spatial allocation of emissions.

*Response:* This is an excellent idea that could be used to improve our inventory data. We are checking to see if funding is available for this type of equipment, but at this point we are not very hopeful.

- **Refine regional and near scale emissions evaluations** – Provide assistance in evaluating the effects of localized emissions versus regional emission effects.

*Response:* This work is ongoing in the major study regions (South Coast, Central Valley, Bay Area), but more could be done in other regions. Unfortunately, because these other regions generally do not have PM exceedance problems, we will typically have to rely on existing transport and monitoring data.

- **Evaluate rule effectiveness and compliance** – It was mentioned that resources could be applied to evaluating the effectiveness of PM control measures and compliance with these measures, which is not now well quantified.

*Response:* This is not an emission inventory project, but there is interest throughout the Western U.S. states to perform this type of work. At this point, ARB does not have funding available to study PM control effectiveness and compliance.

- **Chaparral and grassland burning emission factor and chemical data** – There was a request to fund research to improve the emission factor and chemical data for chaparral and grassland burning.

*Response:* Although funding is not available for new emissions testing, the ARB currently has a contract with UC Berkeley to evaluate which emission factors are the most applicable to burning various types of California vegetation. This should provide reasonable emission rate data, but chemical data will have to be derived from the literature (if available) or by extrapolation from other types of open burning data (such as pine or fir burning).

- **Effects of sea salt on PM formation and variability with meteorology** – This was suggested to help better understand the sources of ambient particulates.

*Response:* Currently there is no specific work planned in this area. In the future, some of the new instrumentation being developed that performs size and chemical single particle analysis may help better understand these effects.



- **Provide opportunity for public input during project development process** – It was requested that opportunities be provided for comment on projects as they are being developed.

*Response:* We will work closely with those interested in selecting, developing, and implementing projects. For example, we have had teleconferences and a meeting with members of the agricultural community to develop the test plan and define other aspects of our project to measure ammonia from fertilizers and soils. However, sometimes due to timing constraints and the need to meet our deadlines, we will not always be able to do a complete outreach process prior to funding for each project. But, once funding is secured and contracting complete, we are always interested in working with interested parties to obtain the most useful and complete results possible from the project.